

Keokuk, Iowa.—The steamer "Minneapolis" (last boat of season) departed on the 4th; floating ice, 6th to 13th; ice-dam five miles below station, causing rapid rise on the 14th; river gorged at this place during morning of 15th; ice breaking up in river, 22d; ice-dam broke but formed again lower down the river on 23d.

Saint Louis, Missouri.—Ice forming rapidly in river on the 7th; floating ice from 10th to 13th, 15th to 18th, 24th, 29th, 31st; on the 18th, the river reached its lowest stage since November 29th, 1880; river rising, 20th; navigation resumed, 21st.

Cairo, Illinois.—Floating ice on the 8th and 9th, closing navigation northward on the latter date; river free of ice, 20th.

Point Pleasant, Louisiana.—Floating ice in river on the 11th.

Ohio river.—Portsmouth, Ohio: navigation suspended on account of floating ice from 16th to 20th; navigation resumed, 21st. Cincinnati, Ohio, floating ice, 8th, 16th to 20th.

Vevay, Indiana: river full of floating ice on 16th; ferry-boats crossing with great difficulty, and navigation generally suspended on the 18th.

Louisville, Kentucky: light ice running from 17th to 21st.

Missouri river.—Fort Bennett, Dakota: river frozen over on the 7th. Yankton, Dakota, river closed from the 2d, to the close of the month.

Omaha, Nebraska: river frozen over on the 7th.

Leavenworth, Kansas: slush ice running, 2d, 3d, 4th, 7th; river frozen along the shores compelling ferry-boats to stop running on the 7th; floating ice, 9th; river clear of ice, 12th; floating ice, 15th; ice-dam, 16th, 17th, 18th; ice-dam broke and navigation resumed during morning of the 19th; floating ice from 23d to 31st.

Hudson river.—Albany, New York: floating ice, 2d, 3d; the steamer "St. John," (last boat of season) departed, 3d; river frozen, navigation closed, 4th; navigation on canals officially closed, 7th. New York City, the steamer "Cayuga," left this port on the 7th, bound northward, but was compelled to return on account of ice. Reports from Poughkeepsie state that navigation is closed at all points north of that place. The steamers of the New York and Rondout Line, have stopped running; and for the first time in seven years, no boats are frozen in the ice. Ardenia, New York, river clear of ice and navigation unobstructed on the 12th.

Lake Michigan.—Chicago, Illinois: navigation closed, 7th; lake frozen, 8th.

Lake Huron.—Port Huron: Saint Clair river frozen over on 8th; navigation closed between this port and Detroit, but still open to Algonac on the 10th; the schooner "Tecumseh," (last boat of season) arrived from Georgian bay on 12th; Lake Saint Clair frozen over, 16th; floating ice in Saint Clair river, 17th, 18th.

Lake Superior.—Marquette, Michigan: harbor frozen over on the 8th; ice moved from around the docks on the 19th.

Lake Ontario.—Rochester, New York: the last schooner ("Great Western") cleared from the port of Charlotte, New York, on the 6th, bound to Port Hope, Ontario, and the last arrival (schooner "Rutherford") from Port Hope, on same date.

Mackinac Straits.—Mackinac City: slush ice along the shores of the straits on the 14th; straits frozen over with ice from one-half to two and one-half inches thick on 18th.

Lake Erie.—Cleveland, Ohio: lake filled with slush ice, 15th; frozen for a distance of one-fourth of a mile from the shore, 16th; ice ten inches thick, 18th; ice broke in lake, 24th.

Presque Isle Bay.—Erie, Pennsylvania: ice from ten to twelve inches thick in bay, 19th.

Buffalo river.—Buffalo, New York: river frozen over at this place on 8th; river frozen at mouth, 15th.

Maquoketa river.—Monticello, Iowa: river closed on the 6th, having been open two hundred and seventy-three days, being twenty-three days less than for 1881.

Rock river.—Rockford, Illinois: floating ice in river, 1st; river frozen over, 3d.

Embarrass river.—Charleston, Illinois: ice four inches thick

on 11th; six inches thick, 18th; ice broke and river rose eight feet, 22d.

Bel river.—Logansport, Indiana: during the morning of the 22d, the ice in the river broke up, being from eight to nine inches in thickness, and passed out without causing damage.

Little Bay De Noquet.—Escanaba, Michigan: last boat of season departed on 7th; bay frozen over, 10th; ice broke up during the morning of the 12; bay frozen over, 16th.

Thunder Bay and Thunder Bay river.—Alpena, Michigan: floating ice in river, 3d; river frozen over and bay partly frozen on the 8th; bay entirely frozen over, and navigation closed for season on the 10th.

Grand river.—Grand Haven, Michigan: Grand river frozen over 6th; river partly open, 12th; river closed, 16th; river open and free of ice, 21st.

Cuyahoga river.—Cleveland, Ohio: river frozen, but opened by tugs on the 7th; several vessels frozen in ice on western part of the lake on the 8th; navigation closed, 14th; ice broke in river, 24th.

Maumee river.—Toledo, Ohio: river covered with thin ice on the 3d; much ice in bay and floating in river, 4th; river frozen over and navigation closed, 7th; ice six inches thick in river on 9th.

Sandusky bay.—Sandusky, Ohio: ice in bay from one to one and a half inches thick, but was broken up by wind on 3d; the steamer "Jay Cook," and sailing vessel "Hattie Wells" (last boats of season), left this port on 6th. Bay froze over during night of 7th.

Detroit river.—Detroit, Michigan: a solid barrier of ice formed across the river near Amherstburg, Michigan, on the 9th, closing navigation; the schooner "Unadilla" was caught in the ice on Lake Erie and several other vessels were cut down by ice; the steamer "City of Detroit" could not return from Cleveland.

Connecticut river.—New Haven, Connecticut: navigation closed on 4th. New London, Connecticut, ice on ponds in vicinity, from six to thirteen inches in thickness, on 31st.

Penobscot river.—Bangor, Maine: river frozen over on 4th; river open, 6th; navigation closed, 8th.

Susquehanna river.—Catawissa, Pennsylvania: the north branch of the Susquehanna was closed by ice on the 8th, but opened gradually during the latter part of the month.

Lake Champlain.—Plattsburg, New York: very heavy ice in harbor and great difficulty experienced in making landings on the 20th.

Alleghany and Monongahela rivers.—Pittsburgh, Pennsylvania: during the early morning of the 24th, the ice broke in the Alleghany, a few miles above the junction, and came down with such force as to do great damage to property along the river banks. The Monongahela river was full of ice, and rose two feet from 1.00 to 3.00 p. m. No damage was done to steamboat property at this city, but the damage to lumber yards is estimated at \$16,000. Morgantown, West Virginia, floating ice in the Monongahela on the 8th, 9th, 18th, 19th, 20th.

Des Moines river.—Des Moines, Iowa: river frozen over on 6th.

Yellowstone river.—Terry's Landing, Montana: river frozen over on 28th.

Erie canal.—Rochester, New York: ice three inches thick, and five boats ice-bound between Syracuse and Rochester, on the 8th.

Delaware and Raritan canal.—Bordentown, New Jersey: canal closed by ice from 18th to 27th, inclusive.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors, at the Signal Service stations, and the average depth at which the observations were taken, are given in the table on the right-hand of chart ii. In the first column of the table, is given the maximum temperature observed during the month; and in the second column, the minimum temperature observed during the same period. Owing to ice formation, observations

were interrupted at the following stations: Escanaba, Michigan, on the 10h, 11th, 16th to 31st; Alpena, Michigan, from the 8th to 31st; Milwaukee, from 1st to 18th; Toledo, Ohio, from 7th to 31st; Detroit, Michigan, from 8th to 31st; Chicago, Illinois, from 8th to 31st; Cleveland, Ohio, from 16th to 20th; Buffalo, New York, from 15th to 31st. Sandusky, Ohio, from 7th to 31st. At Marquette, Michigan, no observations were made from 4th to 18th, owing to breakage of instruments. At Cleveland, Ohio, rough sea prevented observations from being made on 2d and 7th.

The table below shows the highest and lowest temperatures of water at the several stations; the range of water temperature; the mean temperature of the air at the station; and the depth of water at which the observations were taken:

Temperature of Water for December, 1882.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey	45.5	34.5	11.0	5 10	33.7
*Alpena, Michigan	34.5	28.7	5.8	7 6	24.2
Augusta, Georgia	43.0	42.0	6.0	8 8	45.0
Baltimore, Maryland	44.0	33.0	11.0	9 3	36.7
Block Island, Rhode Island	45.5	34.8	10.7	8 4	34.5
Boston, Massachusetts	36.0	33.2	2.8	25 0	30.5
*Buffalo, New York	39.0	32.0	7.0	8 10	27.8
Cedar Keys, Florida	65.0	46.0	19.0	8 8	54.9
Charleston, South Carolina	51.6	47.1	4.5	40 1	48.3
*Chicago, Illinois	34.8	32.4	2.4	7 7	26.0
Chincoteague, Virginia	43.0	31.0	2.0	5 11	36.4
Cleveland, Ohio	39.7	32.4	7.3	14 0	37.3
*Detroit, Michigan	35.0	33.0	2.0	23 10	31.0
*Delaware Breakwater, Delaware	44.3	36.6	7.7	5 6	35.7
Duluth, Minnesota	37.0	32.8	4.4	15 9	17.0
Eastport, Maine	44.3	39.7	5.6	17 5	24.5
*Escanaba, Michigan	38.8	33.0	5.8	15 0	22.9
Galveston, Texas	59.0	52.0	7.0	14 9	57.3
*Grand Haven, Michigan	34.5	28.0	6.5	19 0	28.2
Indianola, Texas	63.6	50.5	13.1	8 10	57.2
Jacksonville, Florida	67.0	53.0	4.0	18 0	54.2
Key West, Florida	77.8	67.6	10.2	15 7	69.5
Marquette, Michigan	40.6	32.0	8.6	13 0	26.5
*Marquette, Michigan	35.9	34.0	1.9	10 6	24.1
*Milwaukee, Wisconsin	34.6	31.6	3.0	8 0	24.3
Mobile, Alabama	64.0	47.0	17.0	15 8	46.5
New Haven, Connecticut	39.1	30.8	8.3	14 6	29.0
New London, Connecticut	43.0	39.0	4.0	12 0	31.3
Newport, Rhode Island	43.7	34.7	9.0	10 8	32.6
New York City	40.2	34.4	5.8	17 0	32.2
Norfolk, Virginia	45.0	37.0	8.0	18 2	40.5
Pensacola, Florida	59.8	49.7	10.1	17 3	50.5
Portland, Maine	40.0	32.0	8.0	18 2	28.7
Portland, Oregon	46.4	38.9	7.5	60 3	45.8
Port Eads, Louisiana	66.9	46.0	10.9	9 3	67.4
Provincetown, Massachusetts	44.5	35.0	9.5	14 0	32.8
Punta Rassa, Florida	71.6	59.6	12.0	10 9	62.6
*Sandusky, Ohio	33.0	32.0	1.0	10 0	29.2
Sandy Hook, New Jersey	47.6	34.3	13.3	1 5	33.3
San Francisco, California	52.4	50.0	2.4	31 10	51.8
Savannah, Georgia	48.6	43.7	4.9	12 5	50.8
Smithville, North Carolina	51.0	46.0	6.0	10 0	44.5
Toledo, Ohio	33.9	32.9	1.0	10 2	30.1
Wilmington, North Carolina	48.0	37.5	10.5	13 0	46.0

* Observations wanting, see text.

The largest monthly ranges of water temperature are: Cedar Keys, Florida, 19°; Mobile, Alabama, 17°; Sandy Hook, New Jersey, 13°3; Indianola, Texas, 13°1; Punta Rassa, Florida, 12°. The smallest are: Chincoteague, Virginia, 2°; San Francisco, California, 2°4; Jacksonville, Florida, 4°; New London, Connecticut, 4°; Duluth, Minnesota, 4°4; Charleston, South Carolina, 4°5; Savannah, Georgia, 4°9.

ATMOSPHERIC ELECTRICITY.

AURORAS.

The most extensively observed display of the month occurred on the evening of the 15th. It was observed generally throughout New England; as far southward as northern New Jersey, and westward to stations in Iowa, Minnesota and Montana. The following description of this display are given:

Eastport, Maine, 15th.—Brilliant auroral arch was visible from 7.00 p. m. until the early morning of the 16th.

Portland, Maine, 15th.—An aurora was visible from 8.00 to 11.30 p. m.; it consisted of a segment of haze surmounted by an arch of greenish-white light extending to an altitude of 20°.

Gardiner, Maine, 15th.—Aurora first observed at 8.00 p. m.; at 9.00 p. m., a low double arch appeared, with dark segment

beneath the lower arch; faint beams were visible. The display continued throughout the night.

Boston, Massachusetts, 15th.—An aurora was observed at 10.00 p. m.; it consisted of a well-defined arch of about 8° in width, with its centre about 20° above the horizon.

New Haven, Connecticut, 15th.—From 8.30 p. m. to midnight an auroral light of moderate brilliancy was observed in the north.

Point Judith, Rhode Island, 15th.—From 7.40 p. m. to daylight of the 16th, a bright yellow auroral light was observed; it extended from northwest to northeast and to an altitude of 15°.

Escanaba, Michigan, 15.—At 9.30 p. m., an aurora, consisting of a pale green light, with dark base, was observed. After midnight an arch was formed and waves of green light were visible. The display continued until 6.30 a. m. of the 16th.

Duluth, Minnesota, 15th.—At 6.45 p. m. a brilliant aurora was observed. It consisted of a dark arch of about 20° altitude from which pale straw and rose-colored streamers shot upward. The display ended at 9.35 p. m.

Springfield, Illinois, 16th.—An aurora was first observed at 4.40 a. m. of the 16th. Streamers extended from near the horizon to an altitude of 35°, and covered about 30° of the northern horizon. These display ended at 5.30 a. m.

Fort Assiniboine, Montana, 16th.—Auroral light observed from 4.00 a. m. to daylight.

Cresco, Iowa, 15th.—From 7.45 to 10.00 p. m., an aurora was visible in the north-northeast; it consisted of a low arch near the horizon.

Monticello, Iowa, 15th.—A very bright aurora was seen; it lasted all night.

This display was also observed at the following stations: Orono, Maine; Charlotte, Vermont; Grafton, New Hampshire; Cambridge, Fall River, and Somerset, Massachusetts; Narragansett Pier and Newport, Rhode Island; Factoryville, New York; Paterson, New Jersey; Northfield, Minnesota; Manitowoc, Wisconsin; Clinton, Cedar Rapids and Humboldt, Iowa.

Others displays were observed on the following dates:

Bismarck, Dakota, 2d.—At 6.00 a. m., a short nebulous auroral beam of 10° in length appeared on the northwestern horizon.

Rising Sun, Indiana, 2d.—Aurora at 7.00 p. m.

Northfield, Minnesota, 2d.

Ithaca, New York, 3d.—Aurora consisting of an arch of white light.

Bangor, Maine, 4th.—An aurora was observed at 4.00 a. m., extending a short distance above the horizon.

Saint Vincent, Minnesota, 6th.—Faint auroral light from 7.00 to 9.00 p. m. Northfield, Minnesota, 10th.

Springfield, Massachusetts, 11th.—Pale yellow auroral light in northern sky.

Fort Brady, Michigan, 11th.—Aurora at 9 p. m.

Tobacco Garden, Dakota, 11th.—Faint aurora at 9.00 p. m.

Fort Macon, North Carolina, 12th.—Faint aurora from 7.30 to 8.50 p. m., consisting of a uniform whitish glow extending in the form of an arch to an altitude of 12°.

Woodstock, Maryland, 14th.—An auroral arch with dark cloud beneath observed.

Fort Myer, Virginia, 16th.—Aurora in northeastern sky; it began during the night and continued till daylight.

Wellsborough, Pennsylvania, 16th.

Fort Keogh, Montana, 16th.—Aurora lasting until 5.50 a. m. of the 17th. Small beams of yellowish color shot upward toward the zenith.

Bangor, Maine, 18th, 19th, 20th.

Springfield, Massachusetts, 17th.—Pale auroral streamers reaching beyond the zenith. An arch was formed with its centre about 20° from the zenith.

Northfield, Minnesota, 17th.

Eastport, Maine, 18th.—Aurora from 11.00 p. m. to morning of the 19th, consisting of an arch of about 30° in altitude.